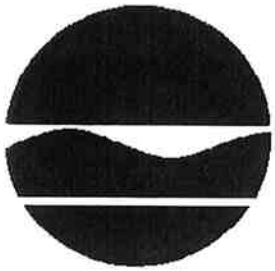
SUPERFUND STANDBY PROGRAM
New York State
Department of Environmental Conservation
50 Wolf Road
Albany, New York 12233-7010

SITE ID 215: CRUCIBLE MATERIALS CORPORATION's SPECIALTY METALS DIVISION FACILITY

SITE SUMMARY REPORT
REVISION 3



Onondaga Lake Project
Task 5: 104(e) Review

Site No. 734030-002
Work Assignment Number D003060-9

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1.0 SITE DESCRIPTION

The information referenced in this report was mainly obtained from the 104(e) responses of Crucible Materials Corporation (CMC, Company ID 2004). Four mailings were received from CMC between October 7, 1994 and February 6, 1996 (see TAMS' Completeness Reviews A and B, March 27, 1995 and April 11, 1996, respectively). Additional information and data were provided by NYSDEC (May 17, 1996 and August 26, 1997) based on TAMS' Completeness Review B. Information obtained from other sources is noted, as necessary.

1.1 Location

The CMC Specialty Metals Division facility is located at 575 State Fair Boulevard in the Town of Geddes, Onondaga County, New York. Figure 1 shows the location of the facility in relation to Onondaga Lake. The site is bound by State Fair Boulevard to the north, Bridge Street to the west, Tributary 5A and the AlliedSignal Semet Residue Ponds to the east, and Consolidated Rail Corporation tracks to the south. The site is approximately 70 acres.

1.2 Geology

The surficial geology of the Syracuse area was strongly influenced by the most recent glacial advance (Wisconsin age, 12,000 to 14,500 years ago). Syracuse occupies a region that was covered by Lake Iroquois, a large glacial lake situated in front of the ice margin. The broad flat-lying plains situated north from Syracuse to Lake Ontario were formed beneath Lake Iroquois and are characterized by lacustrine fine sand and silt deposits. Additional glacial features common to the region are moraines, drumlins, U-shaped valleys and meltwater channels.

Onondaga Lake and all its major tributaries lie within glacial meltwater channels. These features originally were conduits carrying meltwater at large volumes and high velocities away from the glacier. Sediment types characteristically found in meltwater channels are sands and gravels. These relict features form important water bearing and transmitting units which form an irregularly branching, net-like pattern.

The bedrock geology of the greater Syracuse area includes Lower to Middle Paleozoic age sedimentary rocks predominated by carbonate (dolostone and limestone) and shale and containing some sandstone, siltstone and evaporites. Bedrock directly beneath the site (as well as underneath Onondaga Lake) is the Silurian Vernon Shale (Rickard and Fischer, 1970) which has low permeability, but does possess secondary porosity due to fractures.

1.3 Hydrogeology

According to the Syracuse West USGS quadrangle, ground surface elevations at the site range from approximately 370 to 380 feet NGVD. No soil characteristics (e.g., boring logs) or groundwater elevation data were provided by CMC. As stated in a 1980 report by Calocerinos & Spina for Crucible Inc. (CMC, Mailing No. 2, Exhibit 12, p. 2746), a portion of the present CMC site and the area drained by Tributary 5A is underlain by Solvay Process waste material to a depth of 5 to 12 feet.

1.4 Surface Water Hydrology

Surface runoff from the site flows to the storm sewer system and to Tributary 5A of Onondaga Lake. According to Calocerinos & Spina, the tributary is "an artificial body of water which was created in the 1940s and 1950s as a man-made drainage ditch to channel the runoff from the Allied Wastebeds, the Crucible Steel facilities and the railroad right-of-way through what was previously the Geddes Marsh into Onondaga Lake" (p. 2781). The surface

water elevation of Tributary 5A near the site is about 370 feet NGVD. Tributary 5A, which originates near the former location of the Allied Willis Avenue site, runs between the Semet Residue Ponds and the CMC site. For a length of approximately 500 feet, downstream of the CMC wastewater treatment plant discharge, the tributary is culverted underground beneath a rail bed. Thereafter, the tributary is an open watercourse and is then culverted under State Fair Boulevard and Rt. 690 with an outfall to Onondaga Lake (average elevation of about 363 feet NGVD).

2.0 SITE HISTORY

2.1 Owners/Operators

The original mills at the site were constructed in 1887 and 1905. The Crucible Steel Company purchased the mills in 1911. Colt Industries purchased the Crucible Steel Company in 1968. The present owner, Crucible Materials Corporation (CMC), has operated at the site since October 1983.

2.2 Site Operations

CMC manufactures over 400 grades of specialty steel in varying quantities. The site processes, as described in CMC's Mailing No. 1, Exhibit 1, are listed below:

- Melting of various mixtures of scrap metals and added alloys in an electric arc furnace (EAF);
- Argon Oxygen Decarburization Process (AOD) for refining stainless, tool, valve, and other high-grade steels by adding oxygen to the melt from the EAF;
- Compression of large, hot ingots into billets, flats, and rounds with a 2,000-ton press and subsequent heating to forging temperatures;
- Reduction of heated billets into products of specific sizes with rolling mills;
- Conditioning of billets by grinding (an abrasive wheel is used to remove mill scale and other surface defects) and/or pickling (dipping material into various acid or caustic baths to remove scale and other surface impurities);
- Finishing of steel to desired size and shape with smaller roller mills; and
- Annealing/heat treatment, where the steel is heated to a specific temperature and then cooled in air, water or oil.

2.3 Generation and Disposal of Wastes

As identified in Exhibit 1 of Mailing No. 1 and in Mailing No. 3, the following categories of solid wastes (industrial and hazardous) were produced during CMC's ownership and operation (October 1983 to present). Many of these wastes were also likely produced prior to CMC's ownership.

- Slag, from the electric arc furnace, mainly composed of silicates and minor amounts of iron, chromium, aluminum, and nickel. All slag generated after 1987 was recycled;
- Construction and refractory debris, absorbents, etc. from maintenance activities;
- Boiler house ashes produced from coal burning prior to 1988; thereafter, natural gas was used and no ashes were produced;
- Waste coolant swarve, from metal finishing, containing iron, chromium, and nickel;
- Mill scale, from rolling and forging operations, containing iron as the major component with smaller amounts of chromium and nickel;
- Wastewater treatment plant dewatered sludge containing iron and chromium with minor amounts of nickel;
- Waste caustic solids (sludge) and caustic-coated mill scale, produced during pickling operations, containing hexavalent chromium; considered hazardous based on corrosivity and EP toxicity tests for chromium;
- Waste potassium permanganate sludge from de-smutting tank (used in the removal of dirt, oxides, and scale from steel product), discontinued in 1990; considered hazardous;
- Acid pickling sludges, produced during pickling operations, containing iron and chromium; considered hazardous based on corrosivity and EP toxicity tests for chromium; and
- Air emissions (dust) from the EAF and the AOD vessel; considered hazardous based on EP toxicity for chromium.

Waste profiles and laboratory reports were provided by CMC as supporting documentation for characterization of hazardous wastes.

CMC provided copies of USEPA Form R, Toxic Chemical Release Inventory (TRI) reporting forms for 1987 through 1992. Chemicals identified as being released to the environment (atmosphere via point/stack or non-point/fugitive air emissions, surface water, sewer system/POTW, or off-site disposal locations both inside and outside of the basin) during this period include barium, chromium, cobalt, copper, manganese, nickel, vanadium, aluminum oxides, nitric acid, sodium hydroxide, hydrochloric acid, and ethylene glycol. Some wastes were reportedly disposed at the Crucible Landfill at the Lakeside Waste Beds through 1989 including 350,000 pounds of chromium in 1987, 82,464 pounds in 1988, and 19,000 pounds in 1989 (225 tons total, see Table 1).

Summaries of hazardous waste manifests from 1979 to 1994 were included in Exhibit 8 of Mailing No. 1 and Exhibit 5 of Mailing No. 2. In addition to the wastes identified in the TRI forms, PCB wastes in electrical equipment were also generated at the site and disposed at locations outside the basin. Also identified in the manifest summaries are the monthly production rates of wastewater treatment plant (WWTP) sludge from August 1975 through August 1994 (over 1 million pounds per year on average). According to Response No. 10 in CMC's Mailing No. 1, manifest summaries for disposal of WWTP sludge are contained in Exhibit 8 (1983 to 1994). However, the disposal location for the WWTP sludge is not specifically identified in Exhibit 8 of Mailing No. 1 (it does not appear that the WWTP sludge quantities are included in the "caustic sludge" waste category). According to a 1993 Annual Report, WWTP sludge was disposed at the County Landfill, Inc. facility in Pennsylvania (CMC, Mailing No. 1, Exhibit 5, p. 0959). Prior to this, WWTP sludge, considered non-hazardous (p. 0550), was transported to the Lakeside Waste Beds Landfill (1985, p. 0545 and 1986, p. 0549). The WWTP sludge was also disposed at the Seneca Meadows Sanitary

Landfill (1987, p. 0653 and 1990, p. 0698), Niagara Sanitary Landfill (1991, pp. 0733 and 0837), Auburn Sanitary Landfill (1991, p. 0809), and Orleans Sanitary Landfill (1991, p. 0938).

In Exhibit 6 of Mailing No. 1, CMC provided a copy of a 1984 NYSDEC "Hazardous Waste Disposal Questionnaire" containing a listing of historic hazardous waste disposal sites and estimated quantities of hazardous wastes disposed from 1952 to 1982. Hazardous wastes disposed near the facility include caustic-coated mill scale, acid pickling sludge, and EAF/AOD dust. In addition, in Exhibit 3 of Mailing No. 2, CMC provided copies of USEPA "Notification of Hazardous Waste Site" forms (1981) which document disposal of hazardous wastes from approximately 1900 to 1976. Based on these materials, NYSDEC prepared a tabulation for CMC's review of disposal quantities and locations for hazardous wastes generated at the facility and disposed near the plant (NYSDEC, August 17, 1995).

A modified version of NYSDEC's summary tabulation is included herein as Table 1. For wastes identified in the table (except those covered by Note 3), all USEPA waste classifications are D002 (corrosivity), except for EAF dust (K061, specific to emissions from electric arc furnaces in steel industry) and AOD dust (D007, EP toxicity, chromium). As shown in Table 1, hazardous wastes were disposed at the Crucible Landfill at the Lakeside Waste Beds near Lakeview Point in Geddes on the southwest shoreline of Onondaga Lake from 1973 through 1989. According to CMC, this was a permitted landfill during their period of operation from October 1983 to 1989 (CMC, Mailing No. 1, p. 100004). According to Blasland, Bouck & Lee, consultants for AlliedSignal, Waste Bed 5 in the Lakeside Waste Beds 1-8 area was used for landfilling of wastes by Crucible, Inc. (BB&L, April 1989, p. 3-12). A maximum of 41.25 tons of caustic-coated mill scale were disposed at this landfill from 1973 to 1978; this is roughly consistent with the quantity (13.7 tons/year) reported in the Liquid Resource Recovery Report (Calocerinos & Spina, 1978, p. 2857). As reported in the TRI forms (discussed above), hazardous substances were disposed at this landfill from 1987

through 1989. The disposal quantities and waste types, obtained from the 1987, 1988, and 1989 TRI forms, are included in Table 1. The landfill site, currently closed, is not discussed in detail in this Site Summary Report. The Lakeside Waste Beds are shown in Figure 1.

"Construction wastes," not shown in the table but listed in a New York State Hazardous Waste Survey (1976), were disposed "at the Solvay Dump and behind Ballard Construction Company intermittently from approximately 1970 to 1978" (p. 2193). These "construction wastes" include "solids composed of brick, wood, etc.; no free liquid" (p. 2038). Also, according to the TRI forms, approximately 62,000 pounds (p. 0293) and 68,000 pounds (p. 0373) of chromium wastes were transferred to the Ballard Company at 320 Bridge Street, Syracuse, for reuse/recovery (code M26) in 1991 and 1992, respectively.

The Crucible Lake Pump Station disposal area, listed in Table 1, is located on the shoreline of Onondaga Lake between the outlet of Tributary 5A and Waste Beds 1-8 (correspondence from 1965 related to Crucible's 1956 Lake "Fill-in Easement" is included in CMC's Mailing No. 2, Exhibit 15). The location of this disposal area is shown in Figure 1. According to CMC, in addition to the disposal of caustic-coated mill scale (considered hazardous) from 1961 to 1967, grinding dust, slag, boiler ashes, coolant sludge, and C&D debris (all considered non-hazardous) may have been disposed at the Lake Pump Station area (Mailing No. 4, p. 100023). Prior to 1961, caustic-coated mill scale was disposed at the Crucible plant site.

As shown in Table 1, caustic-coated mill scale (considered hazardous) was disposed in the late 1960s and 1970s at the Val's Dodge and Doring properties off State Fair Boulevard in Lakeland, near the northwestern shore of Onondaga Lake. This waste was also disposed in the 1970s at the State Fair Landfill in Geddes, located between Route 695 and Ninemile Creek. The Val's Dodge site (known as Maestri 2) is discussed in a separate Site Summary Report. No additional information is currently available for the Doring site, and thus, a

separate Site Summary Report is not being prepared at this time. The State Fair Landfill site will be addressed separately, as appropriate. The approximate locations of these sites are also shown in Figure 1.

As stated by CMC in Mailing No. 3, the quantities developed by Crucible, Inc. were based upon estimates derived from then-current production rates and not from disposal records. Conversions from tons to cubic feet were done by "estimation." CMC concludes "as there are no records or manifests to review, all, or none, of the wastes may have been deposited at any one of the sites listed" (p. 100016). Bar-mill grinding dust and mill scale are not included in Table 1 since these wastes are not considered hazardous by CMC (Mailing No. 3, p. 100016). However, according to CMC's Mailing No. 1, mill scale contains "iron as the major component with small amounts of chromium and nickel" (p. 0004). Grinding dust consists of "dirt, mill scale and some metals" (p. 2204). Caustic sludge, including caustic-coated mill scale, waste potassium permanganate sludge, and acid pickling sludge are all considered hazardous (p. 100016). Also, EAF/AOD dust, listed in Table 1, is considered hazardous (see 1984 Questionnaire at p. 0993 as well as Exhibit 1 of Mailing No. 1).

In addition to the wastes described above, hazardous substances may have been released to the county sewer system and have been released into Tributary 5A, which discharges directly to Onondaga Lake. These discharges are described in Sections 3 and 4 of this report. According to Crucible, the pickling operation represents the major contaminant loading to the WWTP. This loading is comprised of rinse water (following a "chemical dip") and intentional and unintentional discharges of process chemicals (p. 0982). The following reagents are used for chemical scale removal, plating, coating, and finishing and may be components of the wastewater: molten caustic descale, muriatic acid, nitric hydrofluoric acid, nitric acid, lime, and apex coating solutions (basic) (p. 0982).

Table 1: Summary of Disposal of Hazardous Wastes At and Near the Crucible Plant [1]

Waste Type	Estimated Waste Volume/Weight [2]	Period of Disposal
Crucible Plant (30 acres on-site)		
Caustic-coated mill scale	12,150 ft^3	1900-1960
	60 tons max	1952-1960
Crucible Lake Pump Station (5 acres)		
Caustic-coated mill scale	2,430 ft^3	1961-1967
	52.5 tons max	1961-1967
Behind Val's Dodge, State Fair Boulevard, Lakeland (5 acres)		
Caustic-coated mill scale	405-2,025 ft^3	1968-1973
	23.75 tons max	1968-1973
Doring Property, State Fair Boulevard, Lakeland (5 acres)		
Caustic-coated mill scale	2,025 ft^3	1969-1974
	20 tons max	1969-1974
State Fair Landfill, Geddes (5 acres)		
Caustic-coated mill scale	0-1,620 ft^3	1972-1976
	23.75 tons max	1972-1976
Crucible Landfill at Lakeside Waste Beds 1-8, Geddes		
Caustic-coated mill scale	41.25 tons max	1973-1978
Acid pickling sludge	25 tons max	1973-1981
EAF/AOD Dust	7,938 tons	1973-1982
Chromium Compounds [3]	225 tons	1987-1989
Misc. Compounds (Ba,Co,Cu,Mn,Ni,AlOx,EthGly) [3]	360 tons	1987-1989

Notes:
1. Does not include quantities released in wastewater discharged to Tributary 5A or to the sanitary sewer
2. Volumes in ft^3 obtained from 1981 USEPA Notification of Hazardous Waste Site Forms (pp. 2157-2170) and weights in tons obtained from the 1984 Hazardous Waste Disposal Questionnaire (pp. 0992-0997)
3. Obtained from TRI Forms, 1987 through 1989 (pp. 0007-0120)

3.0 POTENTIAL PATHWAYS FOR RELEASE OF HAZARDOUS SUBSTANCES TO THE LAKE SYSTEM

3.1 Soil

Soil on the Crucible site can be contaminated directly from on-site disposal of manufacturing wastes or from spills from hazardous waste storage and handling areas. The extent of soil contamination is described in Section 4.

3.2 Surface Water

The direct discharge of process wastewater and the migration of contaminated groundwater are significant potential pathways of contamination to Tributary 5A and Onondaga Lake (Tributary 5A discharges to Onondaga Lake about 400 feet downstream from the northerly property limit of the site). In addition, contaminants in surficial soil may be transported to the tributary in surface runoff directly or via the storm drain system.

In 1974, Crucible commenced treatment of wastewater with a final discharge to Tributary 5A. Prior to 1974, untreated process wastewater was discharged to the tributary. The treated discharge is regulated under a NYSDEC SPDES permit (NY-0000825). A schematic diagram of the WWTP is included in Exhibit 13 of Mailing No. 1. Thirteen outfalls are permitted, including Outfall 001 for treated process effluent from the CMC WWTP and Outfalls 002 through 013 for cooling water, steam condensate, groundwater, and stormwater. In the current SPDES permit (1993 to 1998), groundwater discharges are included in all outfalls except for Outfall 001 (process wastes) and Outfall 009 (stormwater runoff from parking lot). According to Exhibit 13 in Mailing No. 1, groundwater accounts for "0 to >10 gpm" of the total discharge to each outfall. The source of groundwater is not stated, but is assumed to result from infiltration.

According to Response No. 10 in Mailing No. 1, approximately 3.2 MGD of recirculated process wastewater are currently treated at the WWTP with about 0.6 MGD of treated effluent discharged daily into Tributary 5A. According to a 1980 Onondaga County Industrial Waste Questionnaire, 1.1 MGD of stormwater and 0.6 MGD of treated process wastewater were released to Tributary 5A (p. 2262). The current nominal flow for Outfall 001 is 0.5 MGD and the flow for Outfall 005 is 1.06 MGD (1995 SPDES Permit Fact Sheet). Wastewater treatment consists of aeration/oxidation, clarification with coagulation/flocculation, and sludge thickening and dewatering (vacuum filtration). About 90 percent of the treated wastewater is recycled for use in mill operations. Polymer and lime are then added to the remaining wastewater for final pH adjustment and heavy metal precipitation in a secondary clarifier prior to discharge to Tributary 5A. Oils are skimmed throughout the plant.

Treated process wastewater, building foundation drain water, and stormwater runoff from the Onondaga Cogeneration Facility (NY-0231860) are released to Tributary 5A through Outfall 005 under CMC's permit ("50 to >1,500 gpm" [p. 1457] or 0.1 to 2 MGD). It is assumed that the "building foundation drain" water is groundwater from the Onondaga Cogeneration site. Flow from the Crucible site is also discharged to Outfall 005, including non-contact cooling water, steam condensate, sink drains, stormwater, and groundwater for a total flow from Outfall 005 of "50 to >3,620 gpm" (p. 1457).

Prior to 1970 (approximate), about 3.6 MGD of water were withdrawn directly from Onondaga Lake, from a location about 400 feet west of the sewage pumping station, and used for cooling and process water (NYS Department of Health, Industrial Water Use and Wastewater Disposal Practices Survey, 1966, p. 2219). An average of 0.8 MGD of municipal water was also used, for a total intake of 4.4 MGD. On average, less than 0.3 MGD of cooling water was recirculated (p. 2220). Of the total, 75,000 gpd of sanitary wastes were discharged to the sewer and drain field, and 10,000 gpd of untreated process water and the

balance (approximately 4.3 MGD on average of heated process cooling water) were released untreated to Onondaga Lake (p. 2220). City water replaced the withdrawal from Onondaga Lake after 1970.

A discussion of effluent quality (discharge monitoring reports and violations) and releases of hazardous substances to surface water is contained in Section 4.

3.3 Groundwater

Groundwater beneath the Crucible site can be contaminated directly from leaching of contaminants from soil or disposed wastes. In addition, site groundwater can be contaminated from nearby hazardous wastes sites, including Allied's former Willis Avenue site and the Semet Residue Ponds. However, the shallow groundwater beneath the Crucible site may not be impacted by these neighboring sites if Tributary 5A behaves as an effective hydrologic barrier. The extent of groundwater contamination is described in Section 4.

3.4 Air

Air emissions represent a local source of contaminants to the atmosphere with potential deposition to the ground surface and subsequent transport to Tributary 5A via surface runoff. Releases of substances to the atmosphere are documented in the 1987 to 1992 TRI forms. Contaminants in surface soil at the site can also be transported to the atmosphere as a dust.

3.5 County Sewer System

Since an Onondaga County Department of Drainage & Sanitation (OCDDS) Industrial Wastewater Discharge Permit was not included, it is inferred that there are no current or recent releases of process wastewater to the sanitary sewer system (p. 2272). According to

a 1980 Onondaga County Industrial Waste Questionnaire, 30,000 gpd of wastewater (assumed typical sanitary wastewater only) were released to the sanitary sewer (p. 2262). The extent of potential historic releases of hazardous substances to the sewer system was not documented.

4.0 LIKELIHOOD OF RELEASE OF HAZARDOUS SUBSTANCES TO THE LAKE SYSTEM

4.1 Documented Releases

Documented Spills

Exhibit 12 of CMC's Mailing No. 1 documents two incidents of release of hazardous substances. In March 1986, approximately 1,000 gallon of nitric acid was released from a storage tank and collected in a contained area. The acid drained to a sump and was pumped to the on-site WWTP. No in-stream data were provided with the spill documentation. Documentation of a June 1992 detection of nitric acid fumes at the WWTP was also provided. Subsequent to the evacuation of plant personnel from the building, a hazardous materials response team inspected the tanks and determined that there was no leak and the fumes were released from the top access hatch of the tank. In Exhibit 10 of Mailing No. 2, Colt Industries documents a July 1972 release of waste acid (nitric acid and hydrofluoric acid mixture) from a leaking truck near the truck scale. No additional data or information were provided to assess the extent of contamination.

In addition, as described in Section 2, Crucible disposed caustic-coated mill scale (60 tons maximum), which is considered a hazardous waste, onto the plant property prior to 1960. According to CMC, the "mill wastes were used to bring the land up to grade in the general area of our warehouse to the WWTP" (p. 2158), which is on the southeastern portion of the property (a plant map was included in the SPDES permit identifying the buildings by number, however, the building number of the warehouse was not provided).

Ongoing/Recent Releases

As discussed in Section 3, ongoing releases from the site include the discharge of treated process wastewater to Tributary 5A as well as releases to the atmosphere from air emissions sources. As discussed in the following section, CMC's current SPDES permit requires monitoring of numerous conventional water quality parameters and hazardous substances, including, but not limited to, chromium, cyanide, zinc, mercury (Outfall 005 only), lead, and copper. Recent monitoring of the outfalls (January through July 1994 DMR data) revealed that some of these substances, including chromium, have been detected in the discharges, but at concentrations below the permit limitation.

4.2 Threat of Release to the Lake System

4.2.1 Extent of Site Contamination

As stated by CMC in Mailing No. 4, except for sampling data associated with their SPDES discharge, "no data exist regarding any sampling done of any on-site media with regard to on-site disposal, spills or releases" (p.100024). It is not clear as to whether this statement covers only the period of CMC's ownership (1983 to present) or includes prior owners. According to CMC, extensive data were collected as part of the closure of the Crucible Landfill at the Lakeside Waste Beds; however, these data were not provided and a discussion of the extent of contamination at this off-site landfill is not included in this Site Summary Report.

AlliedSignal Sampling Data

NYSDEC provided copies of Allied's analytical data from samples collected in 1991 for the Remedial Investigation (RI) of the Semet Residue Ponds site adjacent to the Crucible site

(O'Brien & Gere, May 1992). Groundwater, surface water and sediment samples were collected on Allied's property as well as on CMC's property and Tributary 5A, both upstream and downstream of the Crucible site. In addition, analytical results from groundwater samples collected in 1979 by Geraghty & Miller were provided by NYSDEC, including results from wells 34, 35 and 36 on the Crucible Lake Pump Station site on the shoreline of Onondaga Lake. The sample locations, except for the monitoring wells on Allied's property, are shown on Figure 2 (adapted from Figures 4 and 11 of the O'Brien & Gere report).

Groundwater

Groundwater monitoring wells installed by AlliedSignal on the Crucible side of Tributary 5A include SP-2A near the on-site WWTP and well SP-5 near State Fair Boulevard. Both wells are about 100 feet from Tributary 5A. Metals and inorganics detected in the wells on the Crucible site include aluminum, antimony, arsenic, barium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, nickel, potassium, selenium, sodium, and vanadium. Chromium was detected in the on-site wells at concentrations ranging from 23 to 103 µg/L. Many of these metals, including antimony, arsenic, chromium, cobalt, copper, lead, nickel, selenium, and vanadium, were either not detected in wells on Allied's property or were present at lower concentrations. Volatile organic compounds (VOCs), including BTX compounds (benzene, toluene, and total xylene), and semi-volatiles (SVOCs) were either not detected or were detected at concentrations near the detection limit in the wells on Crucible's property. Some SVOCs were detected (albeit at very low concentrations) in groundwater samples collected from at least one of the wells installed on the Crucible property but were absent, or present at lower concentrations, in samples collected from wells on AlliedSignal property. PCBs (Aroclor 1248) were detected at 1.5 µg/L at well SP-2A on Crucible's property but were not detected (less than 0.5 to 1.0 µg/L per Aroclor) at other wells on Crucible's and Allied's property.

Limited analytical data collected in 1979 by Geraghty & Miller at wells 34, 35, and 36 at the Crucible Lake Pump Station area were also included. Benzene was detected at concentrations of 3,510 and 900 µg/L in well 34 and at concentrations of 38 and 22 µg/L in well 36. Toluene was detected in well 34 at 93 µg/L and in well 36 at 23 µg/L. Based on the limited list of parameters for which these samples were analyzed, there were no detections of other VOCs and SVOCs in these three wells in 1979. According to the 1979 data, benzene and toluene were detected at elevated concentrations in groundwater throughout the Allied Semet Residue Ponds site. In July 1979, benzene was detected at a concentration of 37,500 µg/L at well 15, which is located in the approximate center of Allied's Semet Residue Ponds study area behind the former Willis Avenue plant. It is thus inferred that benzene contamination of groundwater at the Lake Pump Station area is likely the result of historic Allied operations. Results of inorganics and pesticides/PCBs analyses, if performed at these three wells, were not provided.

Based on the presence of BTX compounds in groundwater samples collected from wells on Allied's property and the absence of BTX compounds in wells on the Crucible plant property, it appears that Tributary 5A is behaving as a hydrologic barrier for the shallow groundwater system (except possibly in the Rt. 690 area where the creek is culverted). Thus, it is expected that Tributary 5A prevents the shallow migration of Semet Bed wastes to the Crucible side of the tributary. Therefore, the contaminants, e.g., metals and possibly SVOCs and PCBs, detected in groundwater samples from wells on Crucible's plant property likely originated from the Crucible site or from another upgradient source.

Surface Water

Metals and inorganics detected in surface water samples in Tributary 5A adjacent to or downstream (near the culvert under State Fair Boulevard) of the Crucible site include aluminum, arsenic, barium, calcium, chromium, cobalt, iron, magnesium, manganese, nickel,

potassium, sodium, and vanadium. Chromium was detected in the surface water samples alongside and downstream of the site, at concentrations of 55 and 20 µg/L, respectively. Chromium was not detected at the upstream location on Tributary 5A (less than 5 µg/L). Chromium was also detected in three surface water samples at varying depths in Onondaga Lake at the mouth of Tributary 5A at concentrations ranging from 20 µg/L to 38 µg/L; chromium concentrations in uncontaminated lake waters normally do not exceed 5 µg/L (US Dept. of Health and Human Services, 1991).

Benzene was detected in Tributary 5A surface water upstream, adjacent to, and downstream of the Crucible site at concentrations of 18, 110, and 79 µg/L, respectively. Parameters which were detected in Tributary 5A surface water at greater concentrations at the midstream and downstream stations than at the upstream station include aluminum, barium, calcium, chromium, cobalt, iron, magnesium, manganese, nickel, bromodichloromethane, and BTX compounds. Results of PCB analyses, if performed on the surface water samples of Tributary 5A, were not provided. Limited SVOCs were detected in the Tributary 5A surface water samples, including n-Nitrosodiphenylamine (70 µg/L) and bis(2-ethylhexyl)phthalate (870 µg/L), both detected at the upstream station. Some SVOCs were detected (albeit at very low concentrations) in surface water samples at greater concentrations at the midstream and downstream stations than at the upstream station.

Sediment

Chromium was detected in sediment samples from Tributary 5A upstream, adjacent to, and downstream of the Crucible site at concentrations of 34 (estimated), 2,380 (estimated), and 704 mg/kg (ppm), respectively. Chromium was also detected in sediment samples collected in Onondaga Lake along the shoreline east of the mouth of Tributary 5A at estimated concentrations of 17 and 60 mg/kg. Mercury was detected in sediments both upstream and adjacent to the Crucible site (0.8 to 1.3 mg/kg) but not in a sediment sample collected

downstream of the site. Other inorganics detected at elevated concentrations (greater than 100 mg/kg in at least one of the three locations) in the sediment samples include aluminum, barium, cobalt, copper, iron, lead, magnesium, manganese, vanadium, and zinc. Metals/inorganics detected in sediment samples at greater concentrations at the midstream and/or downstream stations than at the upstream station include aluminum, antimony, barium, chromium, cobalt, copper, iron, magnesium, manganese, potassium, silver, and vanadium. Cyanide was detected at the midstream sediment sample location at an estimated concentration of 2.9 mg/kg.

PCBs were detected in sediments at the midstream station at estimated concentrations of 3,300 µg/kg (Aroclor 1248) and 2,300 µg/kg (Aroclor 1254) and at the downstream station at an estimated concentration of 220 µg/kg (Aroclor 1254). PCBs were not detected at the upstream sediment location (less than 250 to 500 µg/kg per Aroclor). Also, BTX compounds were detected in the midstream sediment samples adjacent to the Crucible site at estimated concentrations ranging from 9,400 to 25,000 µg/kg (round one sample) and concentrations ranging from 6,200 to 19,000 µg/kg (round two sample). However, BTX compounds were not detected in the sediment samples collected upstream and downstream of the site. Methylene chloride was detected at estimated concentrations of 14 and 5 µg/kg at the upstream and downstream sediment stations, respectively. Chlorobenzene was detected at a concentration of 82 µg/kg at the downstream sediment station. Several SVOCs were detected (estimated concentrations) in sediment samples at greater concentrations at the upstream station than at the midstream and downstream stations.

Based on the Allied data and wastewater monitoring data (discussed below), it appears that metals, including chromium, in surface water and sediments of Tributary 5A, as well as in site groundwater, likely originated from the Crucible site and not from other adjacent sources, including the Semet Residue Ponds and the former Allied Willis Avenue Plant. While the available data from Tributary 5A demonstrate elevated concentrations of a number of

contaminants in the midstream and downstream stations relative to the concentrations reported for the upstream station, a source distinction is somewhat more difficult for other water quality parameters (organics) since the Allied ponds/beds run alongside Tributary 5A for the entire length of the Crucible property.

NYSDEC's Lake Pump Station Area Data

In October 1990, NYSDEC Region 7 collected surface soil samples from Crucible's Lake Pump Station disposal area. According to NYSDEC, these samples were collected near the surface (4 inch depth in topsoil) and are not representative of Crucible's caustic-coated mill scale waste (NYSDEC internal transmittal, April 26, 1996). Select metals and PCBs were analyzed in four samples in this area. A sample location map was not provided. A summary of the data is presented in Table 2. Also included in this table are the eastern U.S. background concentrations and recommended soil cleanup objectives presented in NYSDEC's TAGM HWR-94-4046 (NYSDEC, 1994). As shown in Table 2, each parameter, except for silver, was detected at a maximum concentration greater than NYSDEC's recommended soil cleanup objective (site background concentrations were not established). Chromium was detected at concentrations about two to more than three orders-of-magnitude greater than NYSDEC's recommended soil cleanup objective of 10 mg/kg. PCBs were not detected in these surface soil samples.

Toxicity Characteristic Leaching Procedure (TCLP) testing was also conducted on four surface soil samples. In the TCLP testing, only barium and chromium were detected in the leachate of the four samples. Barium was detected in the leachate at concentrations ranging from 0.21 mg/L to 2.1 mg/L (100 mg/L regulatory threshold as per 40 CFR 261.24). Chromium was detected in the leachate of one of the four samples at a concentration of 0.70 mg/L (5.0 mg/L regulatory threshold). The other metals analyzed (arsenic, cadmium, lead, mercury, selenium, and silver) were not detected in the TCLP leachate samples. Thus, based

on the limited TCLP testing for select metals, the samples analyzed are not characterized as hazardous wastes. Once again, it should be noted that these samples were collected from topsoil above the mill scale wastes. It is likely that the wastes buried below this soil are more contaminated than these data show.

Table 2: Summary of NYSDEC's Lake Pump Station Disposal Area Surface Soil Data - Select Metals

Parameter	Range of Concentrations (mg/kg)	Eastern US Background Concentration (mg/kg)	Recommended Soil Cleanup Objective (mg/kg)
Arsenic	14.9 - 18.2	3 - 12	7.5 or SB
Barium	18.1 - 505	15 - 600	300 or SB
Cadmium	6.3 - 31.5	0.1 - 1	1 or SB
Chromium	2,090 - 22,700	1.5 - 40	10 or SB
Lead	ND - 910	200 - 500 (urban)	SB
Mercury	ND - 0.24	0.001 - 0.2	0.1
Selenium	0.56 - 4.9	0.1 - 3.9	2 or SB
Silver	ND	--	SB

Notes:
1. Range of concentrations based on four surface soil samples collected in October 1990; data obtained from NYSDEC, transmitted to TAMS on 8/26/97
2. Background and cleanup objectives concentrations obtained from NYSDEC TAGM HWR-94-4046 (1994)
3. SB = Site Background
4. ND = Not Detected

Sewer Discharges

As stated in Section 3, since an OCDDS Industrial Wastewater Discharge Permit was not included, it is inferred that there are no current or recent releases of process wastewater or hazardous substances to the sanitary sewer system. However, according to the 1987 to 1992

TRI forms, hazardous substances, including nitric acid, hydrochloric acid, sulfuric acid, chromium, nickel, and copper, were released to the sewer system.

Surface Water Discharges

A 1970 report on the characteristics of Crucible's wastewater discharge prior to implementation of full-scale treatment operations was included in CMC's Mailing No. 2, Exhibit 14 (Syracuse University Research Corporation, 1970). As shown in Table 11 of the report (p. 3015), total chromium loadings of the process discharge in June and July 1970 ranged from 15 to 175 lb/day with an average of about 90 lb/day (five measurements), much greater than the current limitation of about 2 lb/day. Hexavalent chromium represented anywhere from 35% to 82% of the total chromium loading. Estimates of the total process flow ranged from 2.3 to 6.6 MGD during the sampling events. Other parameters released at elevated levels include sulfate, phosphate, TSS, COD, oil and grease, manganese, total iron, and copper (p. 3015).

According to Upstate Freshwater Institute (UFI), construction of the Crucible wastewater treatment plant (WWTP) in 1974 reduced the chromium and iron loading to the lake from the facility and upgrades were made to the WWTP in 1981 and 1986 to meet more-stringent effluent limitations (Effler, S.W., 1996). An 85 to 90 percent reduction in metals loading from the facility was reported for 1976 (Effler, S.W., 1996).

Discharge limitations for the following parameters for Outfall 001 (treated process wastewater) are included in CMC's current SPDES permit: flow, TSS, oil and grease, total iron, cyanide, total and hexavalent chromium, zinc, nickel, temperature, pH, lead, and copper. Phosphorus and mercury are also parameters of concern in Outfall 005 (which includes flow from off-site). The total chromium daily average and maximum limitations for Outfall 001 are currently 1.32 and 2.64 lb/day, respectively, whereas the hexavalent chromium daily

average and maximum limitations are 0.1 and 0.25 mg/L, respectively. Total iron daily average and maximum limitations are currently 10 and 20 lb/day, respectively. According to the SPDES Permit Fact Sheet (1995), the current nominal flow for Outfall 001 is 0.5 MGD and the flow for Outfall 005 is 1.06 MGD.

Discharge Monitoring Reports (DMRs) for Outfall 001 for 1983 through 1994 were included in CMC's Mailing No. 1, Exhibit 7. DMRs for 1975 through 1983 were included in CMC's Mailing No. 2, Exhibit 4 (many illegible). No data were provided for the other permitted outfalls (1993 and 1994 DMRs for other outfalls indicate no discharge for many months). Copies of USEPA Notices of Violations (1981 and 1982) were included in CMC's Mailing No. 2, documenting numerous permit violations of total chromium and total iron (pp. 2512 to 2517). According to a 1984 Judicial Complaint included in Exhibit 11 of CMC's Mailing No. 1, permit limitations were violated over 261 times over a 66-month period from Outfall 001 for chloride, chromium, copper, iron, oil and grease, oxidizable cyanide, pH, temperature, and TSS (p. 1446). The majority of these violations were for total chromium, total iron, and temperature prior to CMC's ownership (1983). According to USEPA Compliance Monitoring Reports (1976, 1977, and 1979), Crucible did not comply with the provisions of the NPDES permit (now SPDES) due to violations of the chromium and temperature discharge limitations in 1977 and 1979.

The effects of the discharge of treated wastewater at elevated temperatures from the Crucible facility to Tributary 5A were investigated by Calocerinos & Spina Engineers for Crucible Inc. in 1980. The Thermal Study of Tributary 5A was prepared in support of Crucible's SPDES renewal and modification (Calocerinos & Spina, September 1980). In the aquatic biological survey of the tributary, no fish were collected nor observed in the ambient or affected areas near the discharge. It was suggested that the absence of fish was due to the combined effects of intermittent flow above the discharge (Crucible's discharge, which ranges from 25 to 100 percent of the creek's total flow, approximately doubles the flow within the creek on

average), lack of suitable cover and resting areas, elevated water temperature, and summer stagnation. Periphytic algal growth was minimal within the tributary and could not be used to assess the effects of Crucible's discharge on the creek. Macroinvertebrate species observed in the upstream areas were extremely tolerant to several environmental stresses, including elevated temperatures, low dissolved oxygen concentrations, and extended periods of stagnation. Macroinvertebrate populations were absent in the immediate vicinity of the Crucible WWTP discharge but recovered within a "short" distance downstream (Calocerinos & Spina, p. 2776). The authors concluded that "in view of the types of habitats available below the discharge, it is doubtful, even with the exclusion of the heated discharge, that the downstream areas of Tributary 5A would support any appreciable quantity of quality aquatic life" (Calocerinos & Spina, p. 2776).

Both structural (outfall rerouting to Lake with a diffuser or cooling the effluent discharged to the creek) and regulatory (stream declassification or modification of criteria) alternatives were evaluated. The recommended alternative was to modify the criteria by increasing the maximum summer temperature limitation to 105°F. The temperature limitation in Crucible's SPDES was increased from 90°F to 100°F with a maximum of 105°F for no more than 360 hours per year.

4.2.2 Migration Potential of Contaminants

The known contaminants of concern at the Crucible site include metals, such as chromium, iron, and copper. Upgrades to the on-site WWTP have reduced the concentrations of the metals in the effluent discharging to Tributary 5A of Onondaga Lake as well as the number of SPDES permit violations. Treatment processes evaluated for WWTP upgrades and management of hazardous waste streams were described in the Liquid Resource Recovery Preliminary Report (Calocerinos & Spina, 1978) included in CMC's Mailing No. 2, Exhibit 13. In addition, temperature (thermal discharge) is also considered a parameter of concern

because of its effect on aquatic resources and water quality (e.g., dissolved oxygen saturation).

As stated earlier, the hazardous waste material historically deposited in soil on-site (as well as in the off-site disposal locations) can be transported to the lake system via erosion and runoff or through leaching to groundwater and subsequent groundwater migration to the lake system. Metals, including chromium, which were detected in sediment samples of Tributary 5A near the Crucible site appear to have migrated from the Crucible site. Therefore, it is likely that contaminants from the Crucible site have reached the lake system, which includes the sediments and water of Tributary 5A. The potential also exists for resuspension or diffusion of contaminants from the sediment back to the water column, thus transporting contaminants from Tributary 5A, partly originating from the Crucible site, to Onondaga Lake. Also, NYSDEC's data collected at the Crucible Lake Pump Station disposal area suggests the potential for extensive chromium contamination at each of the off-site disposal areas.

5.0 POTENTIAL FOR ADVERSE IMPACTS TO LAKE SYSTEM DUE TO A RELEASE OR THREAT OF A RELEASE

5.1 Hazardous Substance Characteristics

Based on past operations at the site and elevated concentrations in wastewater, groundwater, surface water, and sediment, metals, in particular chromium, are considered the substances of concern at the Crucible site. As previously stated, upgrades to the on-site wastewater treatment plant have reduced the quantities of hazardous substances released to the lake system. Other substances detected at elevated levels adjacent to the site (see Section 4.2.1), including BTX compounds, are not considered contaminants of concern herein because of their likely origin from nearby hazardous waste sites. PCBs (Aroclor 1248) were detected at a low concentration (1.5 µg/L or ppb) in a single groundwater sample on Crucible's property. PCBs were also detected in Tributary 5A sediment at estimated concentrations of 3.3 ppm (Aroclor 1248) and 2.3 ppm (Aroclor 1254). PCBs were not detected in groundwater samples from wells on Allied's property (0.5 to 1 µg/L detection limit). The source of low-level PCBs in the Crucible well and in Tributary 5A sediments is not known. A discussion of hazardous substance characteristics for the primary contaminant of concern (chromium) is provided below.

Standards/Guidance Values

According to Part 703 of the Codes, Rules, and Regulations of New York State, the water quality standard for chromium (total) in groundwater is 50 µg/L. The water quality standard (aquatic wildlife based) for chromium in New York State surface waters is based on water hardness. The hardness of Tributary 5A was measured as 410 mg/L (ppm) $CaCO_3$ hardness (O'Brien & Gere, October 1991). For Classes A through C surface water, the chromium standard is calculated to be about 660 µg/L. For Class D surface water, the standard is

calculated to be about 5,500 µg/L. As discussed in Section 5.4, Tributary 5A is currently not a classified waterbody. However, according to NYSDEC (November 1997), Class D surface water standards should be used for comparison; thus, the 5,500 µg/L standard would apply (based on a water hardness of 410 mg/L). The sediment guidance values for metals in New York State are based on two levels of risk. For chromium, the Lowest Effect Level is 26 mg/kg (ppm) and the Severe Effect Level is 110 mg/kg (NYSDEC, November 1993).

Background/Chemistry

In aqueous systems, chromium exists in two oxidation states, trivalent, Cr(III), and hexavalent, Cr(VI) (USEPA, December 1979). Some forms of chromium, including Cr(III), are naturally-occurring elements that are considered essential nutrients. Cr(VI) and elemental Cr(0) are generally produced by industrial processes (US Dept. of Health and Human Services, 1991). As stated in Section 2.3, the caustic-coated mill scale waste disposed on site and at several off-site locations contained hexavalent chromium (CMC, Mailing No. 1, pp. 0004-0005) and was classified as hazardous based on EP toxicity tests for total chromium.

The trivalent form is generally insoluble in water whereas the hexavalent form is quite soluble. However, some hydrated trivalent chromium salts, such as Cr(III) chloride-hexahydrate salts, are soluble in water. Also, the alkaline metal salts (e.g., calcium, strontium) of Cr(VI) trioxide (chromic acid) are less soluble in water. The hexavalent form readily reduces to the trivalent form in the presence of oxidizable organic matter and strongly sorbs to organic carbon, which results in the removal of dissolved chromium to sediments. Thus, much of the chromium in surface waters is adsorbed to particulate matter. The hexavalent form will not readily reduce to the trivalent form if the soil pH is high due to the presence of Solvay waste. The trivalent form in the aquatic environment is also hydrolyzed and precipitates as chromium hydroxide [$Cr(OH)_3$] which is insoluble at neutral pH with varying solubility in a low or high pH environment.

Mobility

The fate and mobility of chromium in soil is dependent on the pH, redox potential, and sorption characteristics of the soil; reduction of Cr(VI) to Cr(III) is facilitated by low pH (US Dept. of Health and Human Services, 1991). Chromium in soil is predominantly in the trivalent, Cr(III), form and as an insoluble oxide, and is, therefore, not very mobile in soil (US Dept. of Health and Human Services, 1991). Also, chromium in soil can be transported to the atmosphere as an aerosol or dust or can be transported via surface runoff to receiving waters in soluble or bulk precipitate form. Chromium in soluble and unadsorbed complexes in soil can leach into groundwater, depending upon soil pH (US Dept. of Health and Human Services, 1991).

Toxicity

Hexavalent chromium, Cr(VI), is classified as a human carcinogen (USEPA, 1996). Epidemiological studies of chromate facilities in the United States have found an association between chromium exposure and lung cancer. Workers are likely exposed to both Cr(III) and Cr(VI), however, only Cr(VI) has been found to be carcinogenic in animals (USEPA, 1996). Chromium(VI) is also very toxic to aquatic organisms (USEPA, December 1979). Exposure to high levels of Cr(III), although an essential element, via inhalation, ingestion, or dermal contact may cause serious health effects (US Dept. of Health and Human Services, 1991).

Persistence

In surface waters, no data have been found that would indicate that photolysis, biodegradation, and volatilization of chromium are important fate processes (USEPA, December 1979). Sorption and bioaccumulation are considered important aquatic fate

processes. As discussed above, chemical speciation plays an important role in the fate of chromium in surface water; conditions favorable to Cr(VI) will maintain chromium in soluble form while conditions favorable to Cr(III) will result in precipitation and partitioning to solids and to sediments (USEPA, December 1979). Chromium is not considered as persistent in surface water compared to soil and sediment.

Bioaccumulation

Bioaccumulation of chromium in aquatic organisms and passage through the food chain has been demonstrated (USEPA, December 1979). However, the chromium concentrations decrease with an increase in trophic level. Chromium is not expected to biomagnify in the aquatic food chain (US Dept. of Health and Human Services, 1991). Partitioning studies indicated that bioconcentration factors of benthic invertebrates to water are approximately 2,000 to 3,000 whereas the bioconcentration factor of benthics to sediments is less than one (USEPA, December 1979). In general, chromium is accumulated in aquatic and marine biota to levels much higher than surface water, however, concentrations in biota are usually lower than sediment concentrations. Also, chromium does not biomagnify along the terrestrial food chain from soil to plant to animal (US Dept. of Health and Human Services, 1991).

5.2 Quantity of Substance

Estimates of the mass of hazardous wastes disposed to on-site soils and to off-site disposal areas are contained in Table 1 and are discussed in Section 2 of this report. However, estimates of the amount of hazardous substances (e.g., chromium) in the on-site and off-site disposal areas were not directly provided by CMC except for those estimates in the 1987 to 1992 TRI forms. Estimates of the mass of contaminants released to Tributary 5A are contained in the SPDES permits and associated documentation, including Discharge Monitoring Reports and Disposal Surveys (see Section 4.2.1). In summary, estimates of the

chromium loading to the lake system range from about 175 lb/day (maximum based on five measurements) prior to wastewater treatment in 1970 to about 1 to 3 lb/day (current discharge limits). Also, as documented in the 1989 TRI form (p. 0098), approximately 370 pounds (or about one lb/day) of chromium were released by CMC to Tributary 5A in 1989. It should be noted that these estimates of chromium loading to the lake system include only direct surface water discharges from the permitted outfalls and not potential contribution from contaminated groundwater and direct surface runoff.

5.3 Levels of Contaminants

The extent of on-site contamination was discussed in Section 4.2. No on-site analytical data were provided by CMC in their responses. Limited analytical data on and adjacent to the Crucible site were collected by AlliedSignal for the Remedial Investigation of the Semet Residue Ponds. Chromium was detected in groundwater in one of the Crucible wells at a concentration (103 µg/L) above the groundwater standard (50 µg/L) (see Section 5.1 for a discussion of applicable standards and guidance values). Concentrations of chromium in surface water of Tributary 5A were below the associated standards. A maximum concentration of 55 µg/L was measured in Tributary 5A surface water adjacent to the Crucible site, less than the 5,500 µg/L standard. Chromium was detected in sediments of Tributary 5A at concentrations greater than the NYSDEC guidance value based on ecological effects threshold. An estimated maximum concentration of 2,380 mg/kg (ppm) was measured in Tributary 5A sediment adjacent to the Crucible site, greater than the Severe Effect Level of 110 mg/kg. Also, as discussed in Section 4.2, NYSDEC collected surface soil samples from the Crucible Lake Pump Station disposal area. Chromium was detected at a maximum concentration of 22,700 mg/kg, greater than NYSDEC's recommended soil cleanup objective of 10 mg/kg.

5.4 Impacts on Special Status Areas

The Crucible site is not situated in an area where direct future adverse impact to protected habitats or streams is likely to occur. Tributary 5A near the site is currently not classified in 6 NYCRR Part 895.4, however, the SPDES permit lists the creek as a Class D waterbody. According to NYSDEC, Tributary 5A is no longer a classified waterbody and its intended best use is "industrial drainage." NYSDEC confirmed that this waterbody was not upgraded to Class C (NYSDEC, pers. comm, May 23, 1996).

According to the Syracuse West National Wetlands Inventory map (USDOI, 1978), three federal wetlands exist approximately 300 ft east of the Crucible facility and are each designated as POWK (Palustrine, Open Water, Artificial). These federal wetlands are the Semet Residue Ponds, which are located on the opposite side of Tributary 5A. The nearest New York State freshwater wetlands are approximately one mile west of the site along Ninemile Creek; about one-half mile southwest of the site along the West Flume, a tributary of Geddes Brook and Ninemile Creek; and about one mile east of the site at the mouth of Harbor Brook. Each of these state wetland areas are outside of the direct influence of Tributary 5A but are connected via Onondaga Lake. Also, according to the Habitat Assessment for Allied's Semet Residue Ponds site, no endangered species were identified in 1991 within two miles of the Allied site, directly adjacent to the Crucible site, and there were no designated NYSDEC Significant Habitats within this area at that time (O'Brien & Gere, October 1991). As of August 1996, there were no New York State Natural Heritage Sensitive Elements known in the immediate vicinity of the Crucible site; the nearest Natural Heritage Sensitive Element is about 1.5 miles northwest of the site in Lakeland, near the mouth of Ninemile Creek.

6.0 SUMMARY OF CONCERNS

Based on the data and information provided by Crucible Materials Corporation and NYSDEC, the following concerns are identified:

- Historic release of contaminants, including chromium and other metals, to Tributary 5A and Onondaga Lake prior to treatment of process wastewater in 1974 and subsequent treatment upgrades; chromium was detected in sediment in Tributary 5A adjacent to and downstream of the site at concentrations significantly greater than NYSDEC's Severe Effect Level;

- Potential contamination of on-site soils from chromium and other contaminants due to on-site disposal of caustic-coated mill scale and possibly other wastes from the 1900s to approximately 1960; no on-site soil or groundwater data were provided by CMC;

- PCBs were detected at a low concentration in a single groundwater sample on Crucible's property and in sediments of Tributary 5A but were not detected in wells on Allied's property; source unknown;

- Potential contamination at five off-site disposal locations identified in Table 1 (Crucible Lake Pump Station, Crucible Landfill at the Lakeside Waste Beds, Val's Dodge and Doring properties, and State Fair Landfill) due to off-site disposal of hazardous wastes, including caustic-coated mill scale, acid pickling sludge, and EAF/AOD dust from the early 1960s to about 1989. Limited surface soil data collected by NYSDEC at the Lake Pump Station disposal area indicate extensive chromium contamination; and

- Detrimental effects of historic and current releases of wastewater at elevated temperatures (thermal discharge) on conditions in Onondaga Lake near the mouth of Tributary 5A.

REFERENCES

Blasland, Bouck & Lee (BB&L). April 1989. Hydrogeologic Assessment of the Allied Waste Beds in the Syracuse Area, Volume 1 of 2. Allied-Signal, Inc., Solvay, NY

Calocerinos & Spina. 1978. Liquid Resource Recovery, Preliminary Report. Crucible Incorporated, Specialty Metals Division, Colt Industries.

Calocerinos & Spina. September 1980. Thermal Study of Tributary 5A to Onondaga Lake. Crucible Incorporated, Specialty Metals Division, Colt Industries.

Crucible Materials Corporation. Mailing No. 1: Response to Request for Information. October 7, 1994.

Crucible Materials Corporation. Mailing No. 2: Supplemental Response to Request for Information. December 16, 1994.

Crucible Materials Corporation. Mailing No. 3: Supplemental Response to Request for Information. September 18, 1995.

Crucible Materials Corporation. Mailing No. 4: Supplemental Response to Request for Information. February 6, 1996.

Effler, Steven W. Editor. 1996. Limnological and Engineering Analysis of a Polluted Urban Lake, Prelude to Environmental Management of Onondaga Lake, New York. Springer-Verlag, NY.

NYSDEC. November 1993. Technical Guidance for Screening Contaminated Sediments. Division of Fish and Wildlife.

NYSDEC. January 1994. Revised TAGM HWR-94-4046: Determination of Soil Cleanup Objectives and Cleanup Levels. Division of Hazardous Waste Remediation.

NYSDEC. 104(e) Request for Information. Letter and Attachments to TAMS Consultants, Inc., May 17, 1996.

NYSDEC. Personal communication, Steve Eidt, NYSDEC, Region 7. May 23, 1996.

NYSDEC. Onondaga Lake Project - 104(e) Reviews. Letter to TAMS Consultants, Inc., November 5, 1997.

O'Brien & Gere Engineers, Inc. October 1991. Semet Residue Ponds, Habitat-Based Ecological Assessment. Allied-Signal, Inc., Solvay, NY.

O'Brien & Gere Engineers, Inc. May 1992. Semet Residue Ponds, Remedial Investigation. Analytical Data Results and Sample Location Maps. Allied-Signal, Inc., Solvay, NY.

Rickard, L.V. and D.W. Fischer. 1970. Geologic Map of New York, Finger Lakes Sheet (1:250,000). New York State Museum and Science Service Map and Chart Series Number 15.

Syracuse University Research Corporation. December 1970. Final Report on Flow Measurements and Process Discharges for Crucible Specialty Metals Division, Colt Industries, Syracuse, NY.

TAMS Consultants, Inc. Completeness Review B for Crucible Materials Corporation. April 11, 1996.

TAMS Consultants, Inc. Completeness Review A for Crucible Materials Corporation. March 27, 1995.

United States Department of Health & Human Services. October 1991. Toxicological Profile for Chromium. Draft.

United States Department of the Interior, Fish and Wildlife Service. 1978. National Wetlands Inventory Map: Syracuse West, New York (1:24,000).

United States Environmental Protection Agency (USEPA). December 1979. Water-Related Environmental Fate of 129 Priority Pollutants, Volume I. Washington, D.C.

United States Environmental Protection Agency (USEPA). 1996. Integrated Risk Information System (IRIS). Environmental Criteria and Assessment Office. Cincinnati, Ohio.

Upstate Freshwater Institute (UFI). 1994. The State of Onondaga Lake.

Site Location: Crucible Plant and Disposal Areas

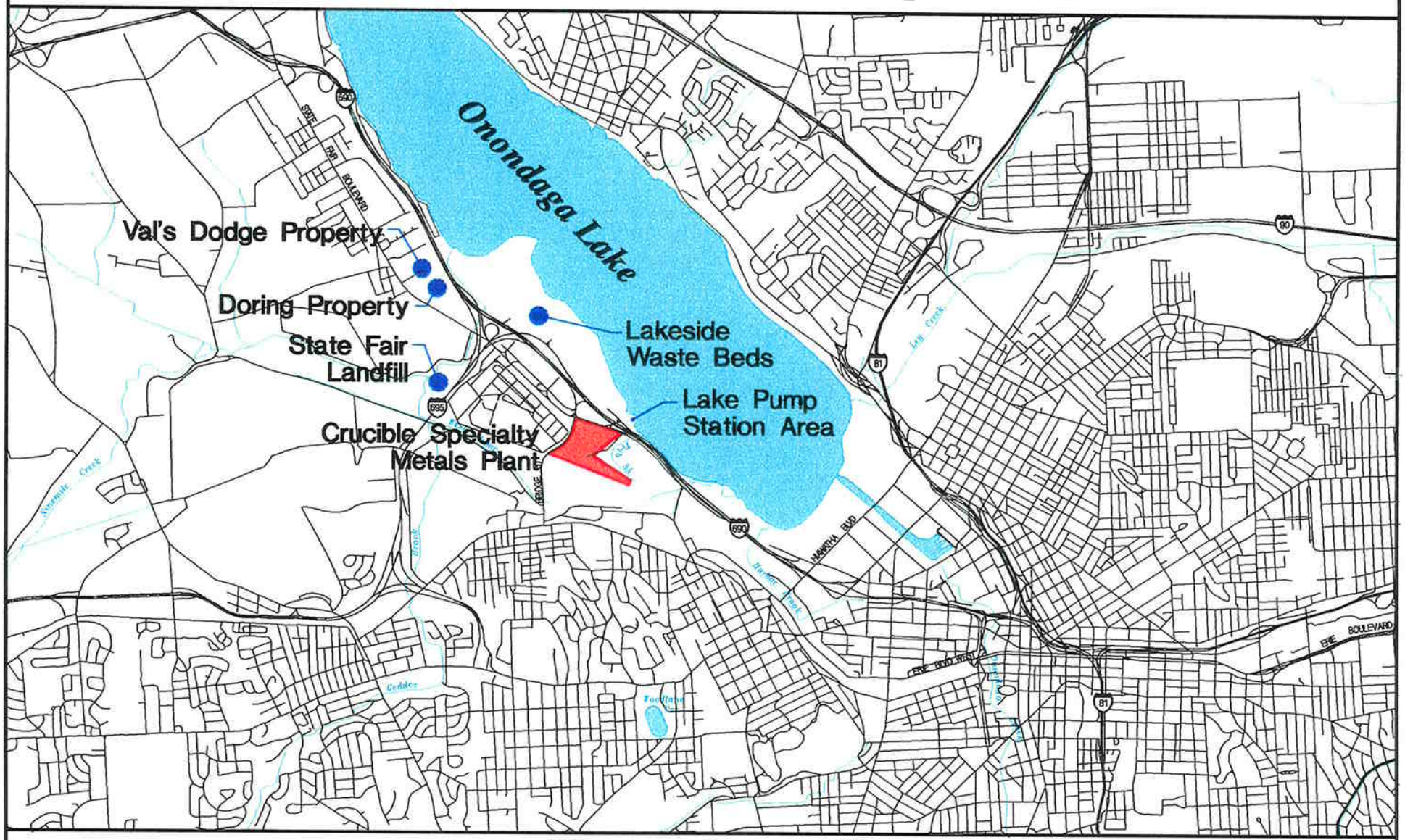

Figure 1

ALLIED-SIGNAL INC.
SOLVAY, NEW YORK

ONONDAGA LAKE

LAKE PUMP STATION AREA

MW-34, 35 and 36

L-WA-T
L-WA-M
L-WA-B

SED-1

SED-2

SED-3

690

APPROXIMATE LOCATION OF IMPASSABLE BARRIER

5A-WA-DN
5A-SD-DN

WELL SP-5

CRUCIBLE SPECIALTY METALS CORP.

5A-WA-MID
5A-SD-MID

2

1

5

3

4

WILLIS AVENUE

5A-WA-UP
5A-SD-UP

WELL SP-2

TRIBUTARY 5A

SOURCE: O'BRIEN & GERE. MAY 1992. SEMET RESIDUE PONDS, REMEDIAL INVESTIGATION. ALLIED- SIGNAL, INC.

23 OCT 1991

LEGEND

- SURFACE WATER SAMPLE LOCATION
- SEDIMENT SAMPLE LOCATION
- SURFACE WATER AND SEDIMENT SAMPLE LOCATION
- 5 POND LOCATION
- TRIBUTARY 5A
- WELL LOCATION (O'BRIEN & GERE WELL)
- WELL LOCATION (GERAGHTY & MILLER WELL)

FIGURE 2

ALLIED'S SAMPLE LOCATION MAP (PARTIAL)

300 0 300

SCALE IN FEET

1163.068.131

O'BRIEN & GERE ENGINEERS, INC.